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1. *Journal of the American Medical Association*, 1997; 277: 1033-1037.

DATE 9-18-57

PROGRESS REPORT - WATERPROOF CONTAINER

PN-528

Delivered to
House 9/18/57
at Akron

Contract RD-111

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D-7989	SK-1875
SK-1910	SK-1885
SK-1886	SK-1887
SK-1888	SK-2055

GTR 213-A-399
213-A-400
213-A-442
213-A-443
213-A-456
213-A-562

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- I. The purpose of this report is to log the progress achieved in the performance of Contract RD-111 for the development and prototype delivery of two water-proof containers. Two methods of closures are to be attempted, one a double slide closure, the other a dove-tail bead type closure or equal.

In lieu of the monthly reports ordinarily expected, we have logged monthly progress in Section V of this report.

- II. The method used so far in this pursuit is that outlined in our proposal:

To survey and select suitable container fabrication material.

To accommodate our double slide closure to use on subject container.

To accommodate a dove-tail wire bead (or equal) closure within the container design.

To deliver a prototype bag for each of the two designs.

- III. The conclusions arrived thus far may be summarized as follows:

- A. To date we have sought the combined feasibility and practicality of a coated body fabric laminated with a specialized impermeable type film.

1. Our laboratory indicates the feasibility of such laminations but have yet to reduce the laminating process compatible to production techniques.
2. Thus far, successful laminates for providing optimum impermeability impose difficulty in use according to usual container fabrication techniques.
3. While the feasibility and practicality features of possible laminates continue, the best commercially available coated fabrics are being sought and utilized for developing the closure techniques.

- B. The waterproof closure utilizing two slide fasteners and a sealing member has proven promising but time consuming in its accommodation to the container for this application and use.

1. At first, hand built models were attempted and proven unreliable in accomplishing sealing action.
2. Extruded cords and retainer sections improved the seal, but were also inadequate, especially on end construction.
3. To accommodate our platen press facility, shorter prototypes were fabricated from molded retainer and cord sections. The cord design was tentatively put aside because:

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B. 3.

- a. Securing proper end sealing in field use was not assured.
- b. The round cord was so unstable between the metal sealing edges in this flexible container it was difficult to effect closure.
- c. The hour glass cord only partially improved the stability through the retainer and cord sections.
- d. The metal strip type seal offered greater cross section stability.



4. A revised molded cross section provided a satisfactory working model for so flexible a construction. Inflation tests were limited to 4 PSI because of limits of bag under test.
5. At present the mold is being revised to accommodate positive placement of the ends of the sealing strip. Pending success in design the mold will be lengthened to accommodate bag dimensions and mounting on test bag.
6. A test model container and closure are now under construction for actual tests of a motor under 30 foot head of water.

- C. We have not attempted any design of the dove tail bead closure.
- D. Since the closures or material have not been designated, no prototypes have been fabricated.
- E. The expenditures to date are indicated in the log attached to this report.

IV. Our recommendations for this program are:

- A. To extend the performance time of the contract by at least two months, due to delays encountered by mold changes, etc.
- B. To develop closures, test containers and prototypes on the better commercial materials now available.
- C. To augment the above by continuing search for the optimum laminate or equal, to a positive or negative answer for feasibility, and practicality in obtaining and fabricating with such materials.

- V. A progress log, by monthly record, is presented below. Reference is made to the schedule of events and estimated expenditures included in our proposal for this contract, a copy of which is attached. We have followed essentially the same outline in presenting our log.

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PN-528 LOG OF PROGRESS

(Outline follows topics as shown on proposal)

For May and June, inclusiveI. Material, Survey:

A. Conference: [redacted] Topic: Possible sources for films and foil laminates and adhesives. 25X1

Conference: [redacted] Dobeckmum for sample films, foils and their characteristics. 25X1

Calls to Vulcan and Haartz-Mason concerning available coated stocks.

B. Material, Selection

1. Sample foils and films received from Dobeckmum tried with cements of Minnesota Mining, Pliobond and General Tire & Rubber.
2. No samplings of special formulations made.
3. Sample permeation and adhesion swatches upon coated stocks were made, such as:

DescriptionResult

- | | |
|--|---|
| a. A series of polyethylene films on top or in between Neoprene V-3 stock and T-15 rubber stock attempted with C-165 or C-5 cements, drum cured open steam and platen press. | In every case the poly-degraded, judged due to required high temperature of typical cure. |
| b. A series of butyl films were checked for adhesion by open steam cure, drum, various solvents. | Butyl porous, probably due open steam and lacking of molding pressure. Seams weak. |
| c. A series of Pliobond impregnated on or between rubber or Neoprene films, open steam, drum. | Pliobond degraded to poor bond. |
4. Fabrication of diffusion dishes by Central Development machine shop, delivered by [redacted] of R&D. Refer design to p.15 of MIL-T-6396A. 25X1

II. Slide Closure

A. Conference: [redacted] Suggested extrusion stock T-15 and V-12. 25X1

B. Materials

1. Sample lab extrusions showed T-15 and V-12 good extrusion stock except for creep and flow of cross section while booked.

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B. Materials Continued

For cross sections for which factory dies made, see SK-1875.

Factory extrusion of cord on SK-1875 found impractical due to thinness of webbing.

2. Attempted closure fabrication.

- a. Repeated attempts drum build SK-1886 and 1885, open steam. Lack of metal adhesion, poorly defined cross section and irregular cord plus poorly sealed ends resulted in abandoning this procedure. Drew up molded types as shown in SK-1887 and 1888, with cores to GTR 213-A-399 and 213-A-400.
- b. Revised cord design to GTR 213-A-442 and 213-A-443 to effect better molding. Ordered with 3 to 4 week delivery.

III. Dovetail Closure

SK-1976 was drawn. Hand built model unsuccessful during cure. No further effort pending material and slide closure decisions.

IV. No Container Fabrication Attempted.

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(Outline follows topics as shown on proposal)

For JulyI. Material

A. No further survey intended until present samples investigated.

B. Selection of material:

1. Samples of Dobeckmum mylar/pliofilm, polyethylene/mylar, saran, polyethylene/vinyl acetate, etc., received and sample tested for adhesion with relatively poor results.

Small order Haartz-Mason MIL-C-19733 coated fabrics cured and uncured, spread received and adhesion tested.

Similarly Neoprene coated samples from Reeves Bros.

2. Fabrication of closures

- a. Several improved building techniques for extruded cross sections tried with similar failure of consistent cross section.
- b. Round sealing cords in SK-1887 were buffed to hour glass section to improve stability across whole closure section, to little avail, even though molded retainer sections obtained.

Cords designed after GTR 213-A-442 and 213-A-443 also proved unstable and inclined to pop out of binding position. End seals were unreliable.

- c. Cords of softer extruded stock requested, received and tried to only slightly better stability.
- d. Revised cords to 213-A-456 - no improvement.

III. No dovetail development accomplished.

IV. No fabrication of container prototype accomplished.

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I. Materials

A. Survey of materials curtailed:

R & D personnel vacation schedules.

Restriction of laminate investigation to pliofilm backed films such as mylar/pliofilm when cured @ 170°F or less on pre-cured coated fabric stocks.

Decision to press for closure design as possibly defining best suited laminate practicability.

B. Selection of materials

Improved samples with mylar/pliofilm on body fabric.

II. Slide closure progress slowed because of factory shutdown and GMP vacation schedule.

A. No survey stocks needed at this time.

B. Selection materials diverted to selection of design to earlier type closure using metal strip as best suited for light weight container.

1. No lab samples of a special stock needed.

2. Altered design, see GTR 213-A-562.

a. Mold ordered to 2 week delivery promise.

b. Sample closure fabricated as seen on inflatable section in CD Lab, GTR 213-A-562.

3. Sample closure mounted on inflatable and tested successfully to 4 PSI G limit of construction.

III. No dove tail design effected.

IV. No fabrication of prototype container effected. However, template layout SK 2055 drawn.

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CONFIDENTIALExpenditures on PN 528

	<u>Engineering</u>	<u>Gen. Dev.</u> <u>Labor</u>	<u>Research</u>	<u>Material</u>	<u>Purchases</u>	<u>Total</u>
Estimate 100%	1,308	1,356	1,232	460	260	4,616
<hr/>						
<u>May</u>	18.36	157.75				176.11
% or est.	(2%)	(12%)				(4%)
<u>June</u>	611.52	61.35		295.53		968.40
% of est. (accumulative)	(48%)	(16%)		(64%)		(25%)
<u>July</u>	600.58	321.09			17.88	939.55
% of est. (accumulative)	(95%)	(40%)			(7%)	(45%)
<u>August</u>	136.72	81.08			26.00	243.80
% of est. (accumulative)	(105%)	(46%)			(17%)	(50%)

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